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EXAMINER	
WITKOWSKI, ALEXANDER C	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/582,503	IMANAKA ET AL.	
	Examiner	Art Unit	
	ALEXANDER C. WITKOWSKI	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822) in view of Mochizuki et al. (US 7,004,569).

Regarding claim 1, as amended, Cleland et al. teaches a liquid discharge head (Fig.1B: 110, 111) comprising:

a plurality of outlets for discharging liquid (col.6, lines 44-47);

a plurality of liquid channels (Fig.4: 315; col.9, lines 37-39), each liquid channel communicating with **a** corresponding outlet (Figs.3, 4: 301, 315);

an inlet for supplying liquid to the liquid channels (Fig.5: 508), the inlet being provided on a substrate (Fig.3, 4: 313);

a plurality of recording elements (Fig.3, 4: 309) disposed in the corresponding liquid channel opposite to the plurality of outlets (Fig.3: 303, 309), each recording element including a heating resistor provided on the substrate (Fig.4: 309, 313), wherein

the outlets include first outlets disposed relatively closer to the inlet (Fig.5: 506; col.9, lines 51-56) and second outlets disposed relatively further from the inlet (Fig.5: 504) and are arranged in a staggered pattern in which the first outlets and the second

outlets are disposed alternately on at least one side of the inlet (Figs.4, 5: showing openings 303 centered over staggered heater resistors 309 alternately at first 506 and second 504 distances from inlet),

the recording elements include first recording elements (Fig.5: 506) corresponding to the first outlets (Fig.4, 5: 309) and second recording elements (Fig.5: 504) corresponding to the second outlets (Figs.4, 5: showing first and second heater resistors [elements] 309 at first row [outlet] 506 and second row [outlet] 504 distances from inlet).

However, Cleland et al. does not teach an aspect ratio based on the flow direction of the liquid channels of the first recording elements is greater than the aspect ratio of the second recording elements.

Mochizuki et al. teaches an aspect ratio based on the flow direction of the liquid channels of the first recording elements (Fig.5A: 94) is greater than the aspect ratio of the second recording elements (Fig.5A: 96).

It would have been obvious for one of ordinary skill in the art at the time that this invention was made to modify Cleland et al. to provide an aspect ratio based on the flow direction of the liquid channels of the first recording elements is greater than the aspect ratio of the second recording elements, as taught by Mochizuki et al., for the purpose of obtaining heat generating capacity elements in proportion to their closeness to the ink ejection opening (col.9, lines 33-36).

Regarding claim 7, as amended, the combination of Cleland et al. and Mochizuki et al. references, as applied to claim 1 above, teaches the liquid discharge head (Fig.1B: 110, 111), further comprising:

a power supply unit (Fig.2B: 217) configured to supply driving voltages to the recording elements (col.8, lines 44-45);

drivers capable of switching **a** condition of power distribution to the recording elements (Fig.2B: 215), the drivers being disposed on the recording elements (Fig.10: col.17, lines 29-34); and

logic circuits configured to selectively drive the drivers (Fig.2B: 215; Fig.11A: 1107; col.18, lines 18-23),

wherein the logic circuits include first and second driving time determining signal supplying units configured to output a signal corresponding to the driving time of the recording elements to the drivers, the first driving time determining signal supplying unit being provided for the first recording elements and the second driving time determining signal supplying unit being provided for the second recording elements (Fig.14; col.19, line 63 to col.20, line 23).

Regarding claim 8, as amended, the combination of Cleland et al. and Mochizuki et al. references, as applied to claim 1 above, teaches the liquid discharge head (Fig.1B: 110, 111), further comprising:

first and second power supply **units** (Fig.2B: 217) configured to supply driving voltages to the recording elements (col.8, lines 44-45);

drivers capable of switching **a** condition of power distribution to the recording elements (Fig.2B: 215), the drivers being disposed on **the** recording elements (Fig.10; col.17, lines 29-34); and

logic circuits configured to selectively drive the drivers (Fig.2B: 215; Fig.11A: 1107; col.18, lines 18-23),

wherein the first power supply unit is provided for the first recording elements and the second power supply unit is provided for the second recording elements (Fig.2B: 217; col.8, lines 44-45).

3. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822) and Mochizuki et al. (US 7,004,569), as applied to claim 1 above, and further in view of Silverbrook et al. (US 6,755,509).

Regarding claim 2, the combination of Cleland et al. and Mochizuki et al. references, as applied to claim 1, teaches the liquid discharge head, wherein each droplet discharged from the first outlets and each droplet discharged from the second outlets have substantially the same volume (col.2, lines 18-20).

However, the combination of Cleland et al. and Mochizuki et al. references does not teach that the value obtained by dividing the area of one of the second recording elements by the area of one of the first recording elements is smaller than 0.95 and greater than 0.60 and the value obtained by dividing the aspect ratio one of the second

recording elements by the aspect ratio of one of the first recording elements is smaller than 0.95.

Silverbrook et al. teaches the value obtained by dividing the area of one of the second recording elements by the area of one of the first recording elements is smaller than 0.95 and greater than 0.60 and the value obtained by dividing the aspect ratio one of the second recording elements by the aspect ratio of one of the first recording elements is smaller than 0.95.

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination Cleland et al. and Mochizuki et al. references to provide that the value obtained by dividing the area of one of the second recording elements by the area of one of the first recording elements is smaller than 0.95 and greater than 0.60 and the value obtained by dividing the aspect ratio one of the second recording elements by the aspect ratio of one of the first recording elements is smaller than 0.95, as taught by Silverbrook et al., for the purpose of adjusting the ratio of surface areas of two heaters to achieve desired weighted drop volumes (col.17, lines 40-43).

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822) and Mochizuki et al. (US 7,004,569), as applied to claim 1 above, and further in view of Hayamizu (US 5,121,143).

Regarding claim 3, the combination of Cleland et al. and Mochizuki et al. references teaches all the limitations in claim 1 above. However, the combination of Cleland et al. and Mochizuki et al. references does not teach the liquid discharge head, wherein the volume of each droplet discharged from the second outlets is smaller than the volume of each droplet discharged from the first outlets.

Hayamizu teaches the liquid discharge head, wherein the volume of each droplet discharged from the second outlets is smaller than the volume of each droplet discharged from the first outlets (col.3, lines 24-30).

It would have been obvious to one of ordinary skill in the art at the time of this invention to modify the combination of Cleland et al. and Mochizuki et al. references to provide that the volume of each droplet discharged from the second outlets is smaller than the volume of each droplet discharged from the first outlets, as taught by Hayamizu, in order to obtain an increased number of printing density levels (Abstract: lines 14-15).

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822), Mochizuki et al. (US 7,004,569), and Hayamizu (US 5,121,143), as applied to claim 3 above, and further in view of Murakami et al. (US 6,789,877).

Regarding claim 4, the combination of Cleland et al., Mochizuki et al., and Hayamizu references teaches all the limitations of claim 3 above.

However, the combination of Cleland et al., Mochizuki et al., and Hayamizu references does not teach the liquid discharge head, wherein the volume of each droplet discharged from the second outlets is 0.4 to 1.0 picoliters.

Murakami et al. teaches the volume of each droplet discharged from the second outlets is 0.4 to 1.0 picoliters.

It would have been obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Cleland et al., Mochizuki et al., and Hayamizu references to provide that the volume of each droplet discharged from the second outlets is 0.4 to 1.0 picoliters, as taught by Murakami et al., for the purpose of conserving ink and enhancing image resolution (col.10, lines 45-47).

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822) and Mochizuki et al. (US 7,004,569), as applied to claim 1 above, and further in view of Moon et al. (US 6,394,588).

Regarding claim 5, the combination of Cleland et al. and Mochizuki et al. references, as applied to claim 1 above, teaches the liquid discharge head, wherein the liquid channels include first liquid channels (Fig.4: 315; col.9, lines 37-39) where the first recording elements are disposed (Fig.5: 506) and second liquid channels (Fig.4: 315; col.9, lines 37-39) where the second recording elements (Fig.5: 504) are disposed.

However, the combination of Cleland et al. and Mochizuki et al. references does not teach that the width of sections of the second channels interposed between

adjacent first recording elements is substantially the same as the width of the first recording elements or narrower than the width of the first recording elements.

Moon et al. teaches that the width of sections of the second channels interposed between adjacent first recording elements is substantially the same as the width of the first recording elements or narrower than the width of the first recording elements (col.4, lines 38-44: disclosing channel narrower than width of heater).

It would be obvious to one of ordinary skill in the art at the time that this invention was made to modify the combination of Cleland et al. and Mochizuki et al. references to provide that the width of sections of the second channels interposed between adjacent first recording elements is substantially the same as the width of the first recording elements or narrower than the width of the first recording elements, as taught by Moon et al., for the purpose of avoiding excessive ink supply pressure drop while effectively utilizing substrate area.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cleland et al. (US 6,799,822) and Mochizuki et al. (US 7,004,569), as applied to claim 1 above, and further in view of Kaneko (US 6,474,790).

Regarding claim 6, as amended, the combination of Cleland et al. and Mochizuki et al. references teaches all the limitations of claim 1 above.

However, the combination of Cleland et al. and Mochizuki et al. references does not teach a first outlet group including **the** first outlets and

a second outlet group including **the** second outlets,

wherein the first and second outlet groups are disposed on both sides of the inlet, and the first outlet group and the second outlet group are offset **by one-half** pitch with respect to each other.

Kaneko teaches that a first outlet group including first outlets (Fig.20A: 70) and a second outlet group including second outlets (Fig.20A: 80), wherein the first and second outlet groups are disposed on both sides of the inlet (col.5, lines 19-22), and the first outlet group and the second outlet group are offset a half pitch with respect to each other (col.14, lines 47-58).

It would have been obvious to one of ordinary skill in the art at the time of that the invention was made to modify the combination of Cleland et al. and Mochizuki et al. references to provide that a first outlet group including first outlets and a second outlet group including second outlets, wherein the first and second outlet groups are disposed on both sides of the inlet, and the first outlet group and the second outlet group are offset a half pitch with respect to each other, as taught in Kaneko, for the purpose of doubling the resolution of the discharge ports, thus improving print quality while avoiding expensive manufacturing techniques otherwise associated with higher resolution printing.

Response to Arguments

(a) Applicants argue that, as recognized in the Office Action, Cleland et al. does not disclose or suggest that an aspect ratio based on a flow direction of liquid channels of first recording elements is greater than the aspect ratio of second recording elements, with the first and second recording elements corresponding respectively to the first and second outlets, and the first outlets being disposed relatively closer to an inlet and the second outlets being disposed

relatively further from the inlet, as is recited in independent Claim 1.
Thus, Cleland et al. fails to disclose or suggest important features of the present invention recited in independent Claim 1.

(b) Mochizuki et al. describes an ink jet printing head including heat generating sections 94 and 96, which have different aspect ratios. The heat generating sections 94, 96 are disposed on a common straight line along an ink flow path, with heat generating section 94 being formed closer to an ink ejection opening than heat generating section 96. Note, for example, column 9, lines 29-37.
Since heaters 94 and 96 are disposed in the same flow path, one of ordinary skill in the art would not look to Mochizuki et al. to change the aspect ratios of the different resistors in Cleland et al., which are not in the same flow path. Nevertheless, even assuming, arguendo, that Cleland et al. could be modified by the teachings of Mochizuki et al., it is respectfully submitted that Mochizuki et al. is opposite to the present invention. That is, heater 94 is believed to be further from the ink supply inlet and thus would correspond to the second recording element and heater 96 would therefore correspond to the first recording element. Accordingly, in Mochizuki et al., the aspect ratio of the first recording element (heater 96) is smaller, not greater, than the aspect ratio of the second recording element (heater 94).

Accordingly, one of ordinary skill in the art would not look to Mochizuki et al. to modify Cleland et al., but even if combinable, Mochizuki et al. would fail to remedy the deficiencies of Cleland et al. noted above with respect to independent Claim 1.

Examiner responds to Applicants' argument (a) by respectfully noting that Mochizuki et al. is relied upon to teach that an aspect ratio based on the flow direction of the liquid channels of the first recording elements is greater than the aspect ratio of the second recording elements. Applicants' observation that Cleland et al. does not teach this limitation is correct, and that observation is affirmed on page 3 of the 04/11/2008 Office action.

Examiner responds to Applicants' argument (b) by respectfully noting that the motivation to combine Cleland et al. and Mochizuki et al. may be found in Mochizuki et

al. at col.9, lines 29-37, wherein is disclosed a straight ink flow path with heaters having different aspect ratios. The Mochizuki et al. heaters are supplied via through-holes by means of the ink supply/distribution member 82 with the supply path 82b connected to supply path 68b of the ink tank 68. The effect is to place Mochizuki et al.'s heaters at any distance from the ink supply.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER C. WITKOWSKI whose telephone number is (571) 270-3795. The examiner can normally be reached on Monday - Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on 571-272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ACW

/STEPHEN D. MEIER/
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